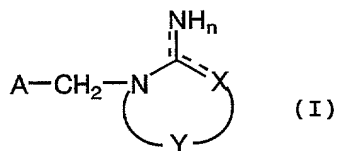


ABSTRACT

There is provided heterocyclic compounds of the following formula (I):



5

in which,

A is optionally substituted aryl group or optionally substituted heterocyclic group;

X is oxygen atom, sulfur atom, carbon atom or nitrogen atom;

10

dotted line shows either presence or absence of bond;

n is integer of 1 or 2; and

Y represents alkylene bond and so on;

or a pharmaceutically acceptable salt thereof.

15

These compounds have good affinity to $\alpha_4\beta_2$ nicotinic acetylcholine receptors and activate the same to thereby exert a preventive or therapeutic effect on cerebral dysfunction.